December 7, 1995

Ms. Andrea Yang
U.S. Environmental Protection Agency (7404)
Chemical Management Division
401 M Street, S.W.
Washington, D.C. 20460

Dear Andrea:

Enclosed are a series of tables which describe the performance measurements (Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value) of various different dust-lead standards as estimated empirically from pre-intervention data from the Baltimore Repair and Maintenance Study. These tables were generated at EPA's request, and serve as a basis of comparison to similar performance measurements estimated using data from the Rochester Lead-in-Dust Study.

Two cautions in particular, should be noted when interpreting the data. The fist caution is that an assumption was made that each child resided in a separate dwelling unit. This assumption may have an impact on the reported values, due to the fact that there were several instances of multiple subjects living within the same dwelling unit in the Baltimore Repair and Maintenance Study. The second caution concerns how houses (and children) were recruited into the study in Baltimore. Since the Baltimore Repair and Maintenance Study was designed to measure the efficacy of specific environmental interventions, houses and children with specific residential lead and blood lead levels were targeted for recruitment into different abatement and control groups. The houses were not selected to be representative of the community at large. The performance measurements of dust-lead standards were usually different among the study groups. Therefore, the information contained in the enclosed tables must be interpreted in light of the targeted population studied.

Please call me at (614)424-3699 with any questions.

Sincerely,

John Menkedick
Senior Research Scientist
Statistics and Data
 Analysis Systems

JM:mk
Enclosures

cc: J. Remmers (EPA TPB)
       J. Jacobson (EPA)

ESTIMATES OF SENSITIVITY, SPECIFICITY,
POSITIVE PREDICTIVE VALUE, AND NEGATIVE PREDICTIVE VALUE,
FROM THE BALTIMORE REPAIR AND MAINTENANCE STUDY

Preliminary Definitions:

Blood Lead Concentration

		Low	Elevated
Dust Lead Standard	Below	a	b
	Above	c	d

Sensitivity = Probability of a dwelling being above the dust lead standard given that there is a resident child with an elevated blood lead concentration. Sensitivity is estimated by $d/(b+d)$.

Specificity = Probability of a dwelling being below the dust lead standard given that a resident child has a low blood lead concentration. Specificity is estimated by $a/(a+c)$.

Positive Predictive Value = Probability of a resident child having an elevated blood lead concentration given that the observed dust lead in the dwelling is above the standard. PPV is estimated by $d/(c+d)$.

Negative Predictive Value = Probability of a resident child having a low blood lead concentration given that the observed dust lead in the dwelling is below the standard. NPV is estimated by $a/(a+b)$.

Description of Tables:

Each table gives the performance characteristics (Sensitivity, Specificity, PPV & NPV) of a set of dust-lead standards based on pre-intervention data from the Baltimore Repair and Maintenance Study. In each table, a dust-lead standard is held constant for one or more components (floors, window sills, or window troughs) and then the standard is allowed to vary across a range of values for one of the three components. For example, Table 1 provides the performance characteristics for a combined dust lead standard which holds the floor lead-loading to under 50 $\mu g/ft^2$, and various window trough lead-loadings which range from 500 to 25,000

µg/ft^2. Each table provides the performance characteristics using two different definitions of elevated blood-lead concentrations (10 and 15 µg/dL).

Table 1a   Floor lead loading held constant at 50 µg/ft^2, window trough lead loading varies from 500 to 25,000 µg/ft^2, elevated blood-lead concentration defined as 10µg/dL.

Table 1b   Floor lead loading held constant at 50 µg/ft^2, window trough lead loading varies from 500 to 25,000 µg/ft^2, elevated blood-lead concentration defined as 15µg/dL.

Table 2a   Floor lead loading held constant at 100 µg/ft^2, window trough lead loading varies from 500 to 25,000 µg/ft^2, elevated blood-lead concentration defined as 10µg/dL.

Table 2b   Floor lead loading held constant at 100 µg/ft^2, window trough lead loading varies from 500 to 25,000 µg/ft^2, elevated blood-lead concentration defined as 15µg/dL.

Table 3a   Floor lead loading held constant at 50 µg/ft^2, window sill lead loading varies from 50 to 1,000 µg/ft^2, elevated blood-lead concentration defined as 10 µg/dL.

Table 3b   Floor lead loading held constant at 50 µg/ft^2, window sill lead loading varies from 50 to 1,000 µg/ft^2, elevated blood-lead concentration defined as 15 µg/dL.

Table 4a   Floor lead loading held constant at 100 µg/ft^2, window sill lead loading varies from 50 to 1,000 µg/ft^2, elevated blood-lead concentration defined as 10 µg/dL.

Table 4b   Floor lead loading held constant at 100 µg/ft^2, window sill lead loading varies from 50 to 1,000 µg/ft^2, elevated blood-lead concentration defined as 15 µg/dL.

Table 5a   Window sill lead loading held constant at 1,000 µg/ft^2, floor lead loading varies from 25 to 500 µg/ft^2, elevated blood-lead concentration defined as 10 µg/dL.

Table 5b   Window sill lead loading held constant at 1,000 µg/ft^2, floor lead loading varies from 25 to 500 µg/ft^2, elevated blood-lead concentration defined as 15 µg/dL.

Table 6a   Window trough lead loading held constant at 10,000 µg/ft^2, floor lead loading varies from 25 to 500 µg/ft^2, elevated blood-lead concentration defined as   10 µg/dL.

Table 6b   Window trough lead loading held constant at 10,000 µg/ft^2, floor lead loading varies from 25 to 500 µg/ft^2, elevated blood-lead concentration defined as   15 µg/dL.

Table 7a   Window sill and trough lead loading held constant at 1,000 and 10,000 µg/ft^2 respectively, floor lead loading varies from 25 to 200 µg/ft^2, elevated blood-lead concentration defined as 10 µg/dL.

Table 7b   Window sill and trough lead loading held constant at 1,000 and 10,000 µg/ft^2 respectively, floor lead loading varies from 25 to 200 µg/ft^2, elevated blood-lead concentration defined as 15 µg/dL.

Table 1a   Performance Characteristics of Potential Window Trough Dust Lead Standards when used in Conjunction with a Floor Dust Lead Standard of 50 μg/ft^2

Baltimore Repair and Maintenance Study

Trough Standard (μg/ft^2)	% Dwellings Failing the Trough Standard	Blood Lead Standard of 10 μg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
500	0.826	0.981	0.115	0.495	0.875
800	0.817	0.981	0.131	0.500	0.889
1000	0.809	0.981	0.148	0.505	0.900
1500	0.765	0.981	0.164	0.510	0.909
2000	0.757	0.981	0.180	0.515	0.917
3000	0.696	0.981	0.197	0.520	0.923
4000	0.687	0.981	0.197	0.520	0.923
5000	0.678	0.981	0.213	0.525	0.929
6000	0.678	0.981	0.213	0.525	0.929
8000	0.678	0.981	0.213	0.525	0.929
10000	0.661	0.981	0.213	0.525	0.929
15000	0.643	0.981	0.213	0.525	0.929
20000	0.635	0.981	0.213	0.525	0.929
25000	0.626	0.981	0.213	0.525	0.929
None	0.000	0.944	0.213	0.515	0.813

Table 1b   Performance Characteristics of Potential Window Trough Dust Lead Standards when used in Conjunction with a Floor Dust Lead Standard of 50 µg/ft^2

Baltimore Repair and Maintenance Study

Trough Standard (µg/ft^2)	% Dwellings Failing the Trough Standard	Blood Lead Standard of 15 µg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
500	0.826	1.000	0.094	0.280	1.000
800	0.817	1.000	0.106	0.283	1.000
1000	0.809	1.000	0.118	0.286	1.000
1500	0.765	1.000	0.129	0.288	1.000
2000	0.757	1.000	0.141	0.291	1.000
3000	0.696	1.000	0.153	0.294	1.000
4000	0.687	1.000	0.153	0.294	1.000
5000	0.678	1.000	0.165	0.297	1.000
6000	0.678	1.000	0.165	0.297	1.000
8000	0.678	1.000	0.165	0.297	1.000
10000	0.661	1.000	0.165	0.297	1.000
15000	0.643	1.000	0.165	0.297	1.000
20000	0.635	1.000	0.165	0.297	1.000
25000	0.626	1.000	0.165	0.297	1.000
None	0.000	0.967	0.176	0.293	0.938

Table 2a Performance Characteristics of Potential Window Trough Dust Lead Standards when used in Conjunction with a Floor Dust Lead Standard of 100 µg/ft^2

Baltimore Repair and Maintenance Study

Trough Standard (µg/ft^2)	% Dwellings Failing the Trough Standard	Blood Lead Standard of 10 µg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
500	0.826	0.981	0.164	0.510	0.909
800	0.817	0.981	0.180	0.515	0.917
1000	0.809	0.981	0.197	0.520	0.923
1500	0.765	0.981	0.213	0.525	0.929
2000	0.757	0.981	0.230	0.530	0.933
3000	0.696	0.963	0.262	0.536	0.889
4000	0.687	0.963	0.262	0.536	0.889
5000	0.678	0.963	0.279	0.542	0.895
6000	0.678	0.963	0.279	0.542	0.895
8000	0.678	0.963	0.279	0.542	0.895
10000	0.661	0.963	0.279	0.542	0.895
15000	0.643	0.963	0.279	0.542	0.895
20000	0.635	0.963	0.279	0.542	0.895
25000	0.626	0.944	0.279	0.537	0.850
None	0.000	0.889	0.344	0.545	0.778

Table 2b   Performance Characteristics of Potential Window Trough Dust Lead Standards when used in Conjunction with a Floor Dust Lead Standard of 100 µg/ft^2

Baltimore Repair and Maintenance Study

Trough Standard (µg/ft^2)	% Dwellings Failing the Trough Standard	Blood Lead Standard of 15 µg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
500	0.826	1.000	0.129	0.288	1.000
800	0.817	1.000	0.141	0.291	1.000
1000	0.809	1.000	0.153	0.294	1.000
1500	0.765	1.000	0.165	0.297	1.000
2000	0.757	1.000	0.176	0.300	1.000
3000	0.696	0.967	0.200	0.299	0.944
4000	0.687	0.967	0.200	0.299	0.944
5000	0.678	0.967	0.212	0.302	0.947
6000	0.678	0.967	0.212	0.302	0.947
8000	0.678	0.967	0.212	0.302	0.947
10000	0.661	0.967	0.212	0.302	0.947
15000	0.643	0.967	0.212	0.302	0.947
20000	0.635	0.967	0.212	0.302	0.947
25000	0.626	0.933	0.212	0.295	0.900
None	0.000	0.900	0.282	0.307	0.889

Table 3a   Performance Characteristics of Potential Window Sill Dust Lead Standards when used in Conjunction with a Floor Dust Lead Standard of 50 μg/ft^2

Baltimore Repair and Maintenance Study

Sill Standard (μg/ft^2)	% Dwellings Failing the Window Sill Standard	Blood Lead Standard of 10 μg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
50	0.809	0.981	0.213	0.525	0.929
100	0.730	0.981	0.213	0.525	0.929
150	0.730	0.981	0.213	0.525	0.929
200	0.722	0.981	0.213	0.525	0.929
250	0.713	0.981	0.213	0.525	0.929
300	0.704	0.981	0.213	0.525	0.929
400	0.696	0.981	0.213	0.525	0.929
500	0.696	0.981	0.213	0.525	0.929
600	0.696	0.981	0.213	0.525	0.929
700	0.670	0.981	0.213	0.525	0.929
800	0.670	0.981	0.213	0.525	0.929
900	0.670	0.981	0.213	0.525	0.929
1000	0.652	0.981	0.213	0.525	0.929
None	0.000	0.944	0.213	0.515	0.813

Table 3b   Performance Characteristics of Potential Window Sill Dust Lead Standards when
used in Conjunction with a Floor Dust Lead Standard of 50 μg/ft^2

Baltimore Repair and Maintenance Study

Window Sill Standard (μg/ft^2)	% Dwellings Failing the Window Sill Standard	Blood Lead Standard of 15 μg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
50	0.809	1.000	0.165	0.297	1.000
100	0.730	1.000	0.165	0.297	1.000
150	0.730	1.000	0.165	0.297	1.000
200	0.722	1.000	0.165	0.297	1.000
250	0.713	1.000	0.165	0.297	1.000
300	0.704	1.000	0.165	0.297	1.000
400	0.696	1.000	0.165	0.297	1.000
500	0.696	1.000	0.165	0.297	1.000
600	0.696	1.000	0.165	0.297	1.000
700	0.670	1.000	0.165	0.297	1.000
800	0.670	1.000	0.165	0.297	1.000
900	0.670	1.000	0.165	0.297	1.000
1000	0.652	1.000	0.165	0.297	1.000
None	0.000	0.967	0.176	0.293	0.938

Table 4a   Performance Characteristics of Potential Window Sill Dust Lead Standards when
used in Conjunction with a Floor Dust Lead Standard of 100 µg/ft^2

Baltimore Repair and Maintenance Study

Sill Standard (µg/ft^2)	% Dwellings Failing the Window Sill Standard	Blood Lead Standard of 10 µg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
50	0.809	0.963	0.279	0.542	0.895
100	0.730	0.963	0.279	0.542	0.895
150	0.730	0.963	0.279	0.542	0.895
200	0.722	0.963	0.279	0.542	0.895
250	0.713	0.963	0.279	0.542	0.895
300	0.704	0.963	0.279	0.542	0.895
400	0.696	0.963	0.279	0.542	0.895
500	0.696	0.963	0.279	0.542	0.895
600	0.696	0.963	0.279	0.542	0.895
700	0.670	0.963	0.279	0.542	0.895
800	0.670	0.963	0.279	0.542	0.895
900	0.670	0.963	0.279	0.542	0.895
1000	0.652	0.963	0.279	0.542	0.895
None	0.000	0.889	0.344	0.545	0.778

Table 4b   Performance Characteristics of Potential Window Sill Dust Lead Standards when used in Conjunction with a Floor Dust Lead Standard of 100 µg/ft^2

Baltimore Repair and Maintenance Study

Window Sill Standard (µg/ft²)	% Dwellings Failing the Window Sill Standard	Blood Lead Standard of 15 µg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
50	0.809	0.967	0.212	0.302	0.947
100	0.730	0.967	0.212	0.302	0.947
150	0.730	0.967	0.212	0.302	0.947
200	0.722	0.967	0.212	0.302	0.947
250	0.713	0.967	0.212	0.302	0.947
300	0.704	0.967	0.212	0.302	0.947
400	0.696	0.967	0.212	0.302	0.947
500	0.696	0.967	0.212	0.302	0.947
600	0.696	0.967	0.212	0.302	0.947
700	0.670	0.967	0.212	0.302	0.947
800	0.670	0.967	0.212	0.302	0.947
900	0.670	0.967	0.212	0.302	0.947
1000	0.652	0.967	0.212	0.302	0.947
None	0.000	0.900	0.282	0.307	0.889

Table 5a   Performance Characteristics of Potential Floor Dust Lead Standards when used in
Conjunction with a Window Sill Dust Lead Standard of 1000 μg/ft^2

Baltimore Repair and Maintenance Study

Floor Standard (μg/ft²)	% Dwellings Failing the Floor Standard	Blood Lead Standard of 10 μg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
25	0.922	1.000	0.148	0.509	1.000
40	0.878	1.000	0.197	0.524	1.000
50	0.861	0.981	0.213	0.525	0.929
75	0.826	0.981	0.262	0.541	0.941
100	0.765	0.963	0.279	0.542	0.895
200	0.617	0.944	0.328	0.554	0.870
300	0.513	0.889	0.361	0.552	0.786
400	0.400	0.852	0.361	0.541	0.733
500	0.348	0.833	0.377	0.542	0.719
None	0.000	0.722	0.410	0.520	0.625

Table 5b   Performance Characteristics of Potential Floor Dust Lead Standards when used in Conjunction with a Window Sill Dust Lead Standard of 1000 μg/ft^2

Baltimore Repair and Maintenance Study

Floor Standard (μg/ft^2)	% Dwellings Failing the Floor Standard	Blood Lead Standard of 15 μg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
25	0.922	1.000	0.106	0.283	1.000
40	0.878	1.000	0.141	0.291	1.000
50	0.861	1.000	0.165	0.297	1.000
75	0.826	1.000	0.200	0.306	1.000
100	0.765	0.967	0.212	0.302	0.947
200	0.617	0.933	0.247	0.304	0.913
300	0.513	0.900	0.294	0.310	0.893
400	0.400	0.867	0.306	0.306	0.867
500	0.348	0.867	0.329	0.313	0.875
None	0.000	0.700	0.365	0.280	0.775

Table 6a   Performance Characteristics of Potential Floor Dust Lead Standards when used in
Conjunction with a Window Trough Dust Lead Standard of 10,000 µg/ft^2

Baltimore Repair and Maintenance Study

Floor Standard (µg/ft^2)	% Dwellings Failing the Floor Standard	Blood Lead Standard of 10 µg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
25	0.922	1.000	0.148	0.509	1.000
40	0.878	1.000	0.197	0.524	1.000
50	0.861	0.981	0.213	0.525	0.929
75	0.826	0.981	0.262	0.541	0.941
100	0.765	0.963	0.279	0.542	0.895
200	0.617	0.944	0.311	0.548	0.864
300	0.513	0.889	0.344	0.545	0.778
400	0.400	0.852	0.344	0.535	0.724
500	0.348	0.852	0.344	0.535	0.724
None	0.000	0.722	0.393	0.513	0.615

Table 6b   Performance Characteristics of Potential Floor Dust Lead Standards when used in Conjunction with a Window Trough Dust Lead Standard of 10,000 μg/ft^2

Baltimore Repair and Maintenance Study

Floor Standard (μg/ft^2)	% Dwellings Failing the Floor Standard	Blood Lead Standard of 15 μg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
25	0.922	1.000	0.106	0.283	1.000
40	0.878	1.000	0.141	0.291	1.000
50	0.861	1.000	0.165	0.297	1.000
75	0.826	1.000	0.200	0.306	1.000
100	0.765	0.967	0.212	0.302	0.947
200	0.617	0.933	0.235	0.301	0.909
300	0.513	0.900	0.282	0.307	0.889
400	0.400	0.867	0.294	0.302	0.862
500	0.348	0.867	0.294	0.302	0.862
None	0.000	0.733	0.365	0.289	0.795

Table 7a   Performance Characteristics of Potential Floor Dust Lead Standards when used in Conjunction with a Window Trough Dust Lead Standard of 10,000 μg/ft^2 and a Window Sill Dust Lead Standard of 1,000 μg/ft^2

Baltimore Repair and Maintenance Study

Floor Standard (μg/ft^2)	% Dwellings Failing the Floor Standard	Blood Lead Standard of 10 μg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
25	0.922	1.000	0.148	0.509	1.000
40	0.878	1.000	0.197	0.524	1.000
50	0.861	0.981	0.213	0.525	0.929
75	0.826	0.981	0.262	0.541	0.941
100	0.765	0.981	0.279	0.546	0.944
125	0.713	0.981	0.279	0.546	0.944
150	0.678	0.963	0.311	0.553	0.905
175	0.678	0.963	0.311	0.553	0.905
200	0.617	0.963	0.311	0.553	0.905
None	0.000	0.778	0.377	0.525	0.657

Table 7b   Performance Characteristics of Potential Floor Dust Lead Standards when used in
Conjunction with a Window Trough Dust Lead Standard of 10,000 μg/ft^2 and a
Window Sill Dust Lead Standard of 1,000 μg/ft^2

Baltimore Repair and Maintenance Study

Floor Standard (μg/ft^2)	% Dwellings Failing the Floor Standard	Blood Lead Standard of 15 μg/dL			
		Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
25	0.922	1.000	0.106	0.283	1.000
40	0.878	1.000	0.141	0.291	1.000
50	0.861	1.000	0.165	0.297	1.000
75	0.826	1.000	0.200	0.306	1.000
100	0.765	1.000	0.212	0.309	1.000
125	0.713	1.000	0.212	0.309	1.000
150	0.678	0.967	0.235	0.309	0.952
175	0.678	0.967	0.235	0.309	0.952
200	0.617	0.967	0.235	0.309	0.952
None	0.000	0.767	0.329	0.288	0.800